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Holding means for the blade-shaped cutting knife of a microtome

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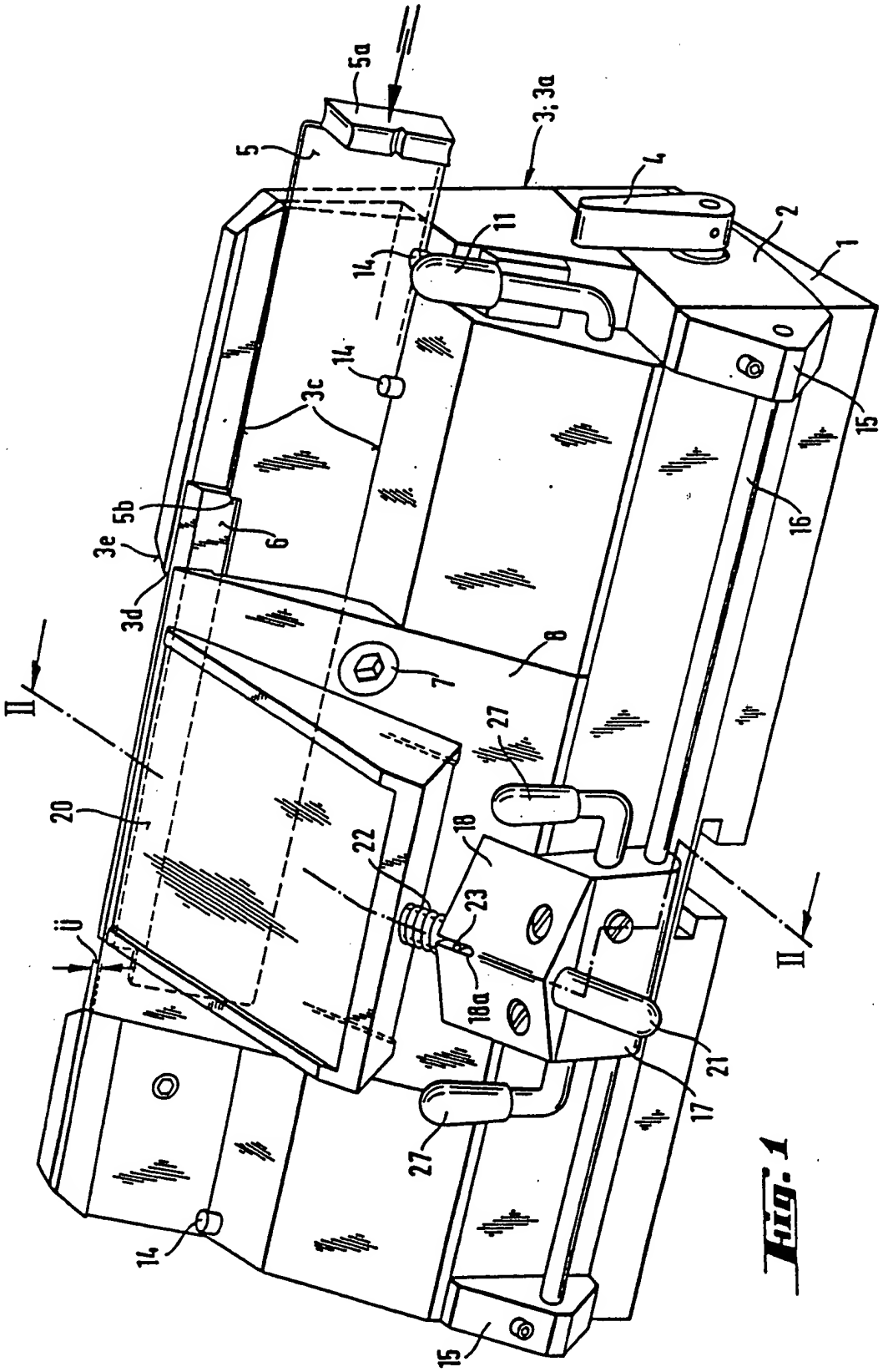
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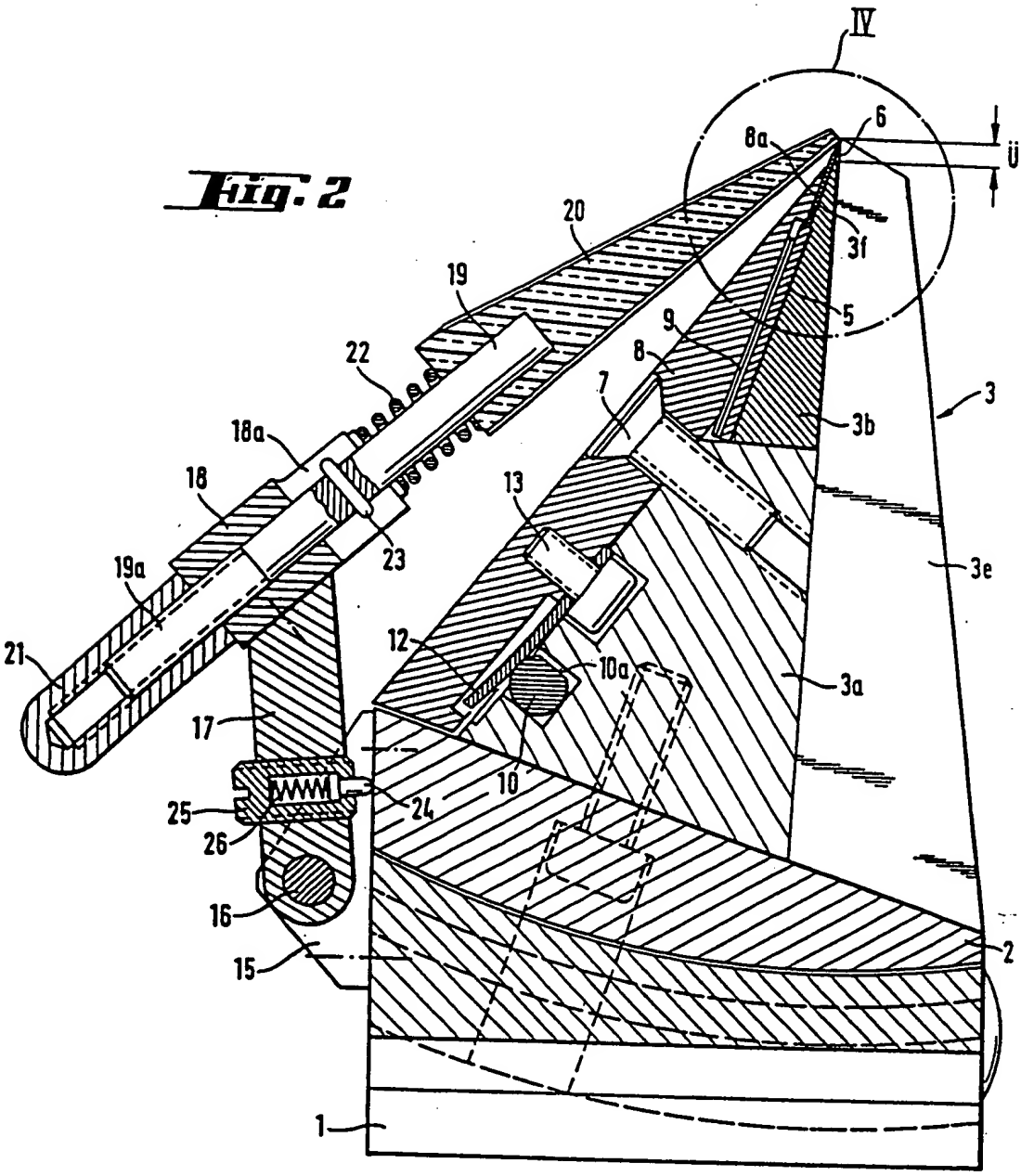
Fig. 1

Fig. 2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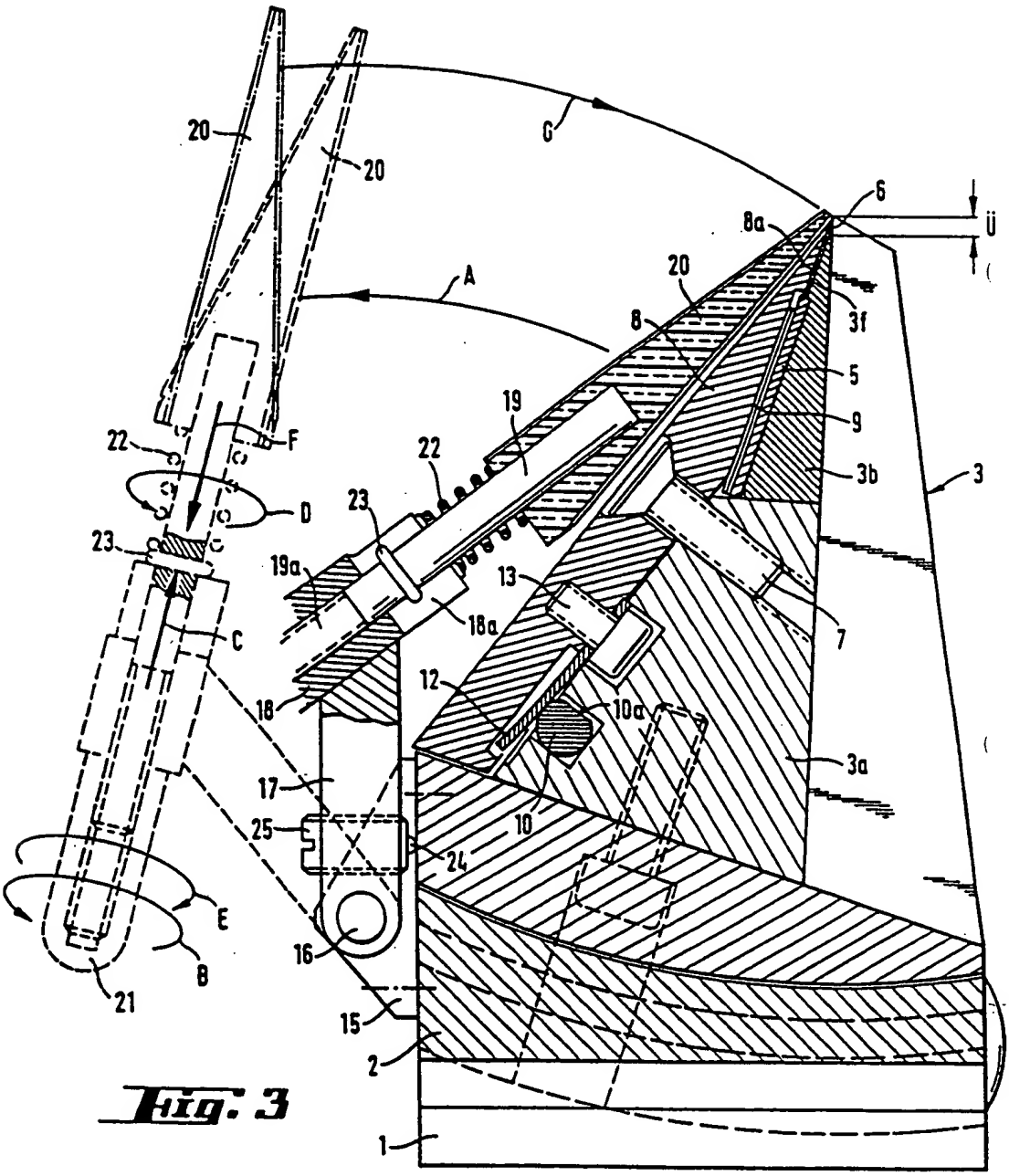
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Fig. 3

Fig. 4

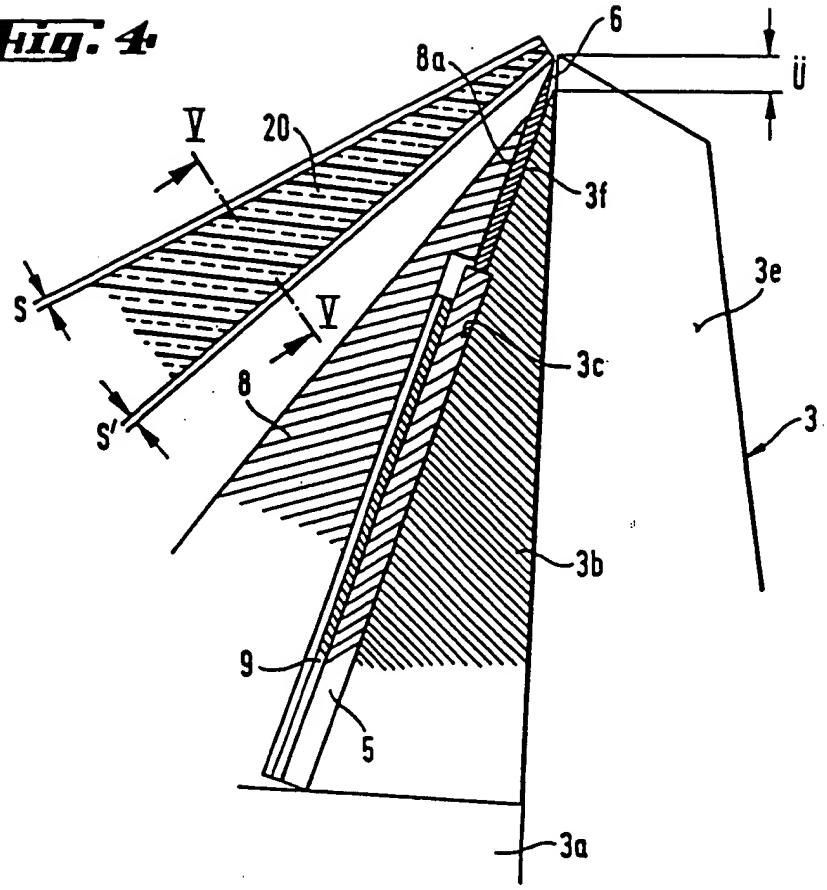


Fig. 5

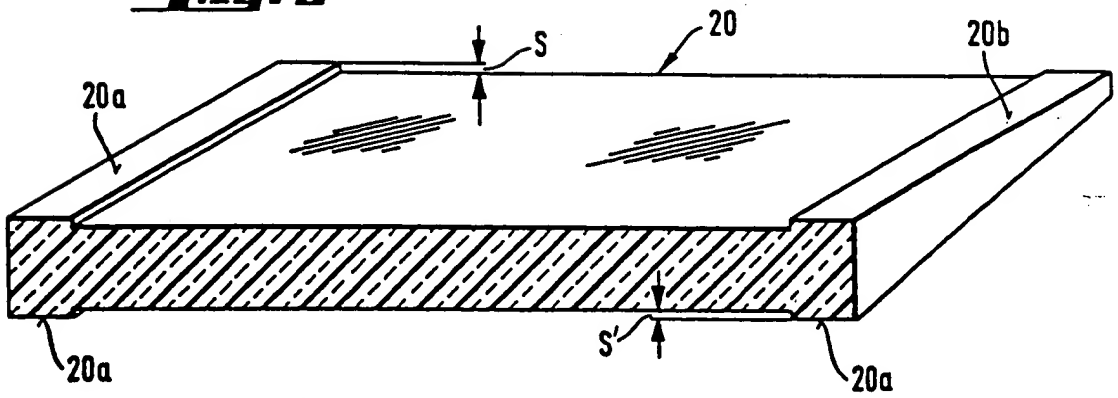
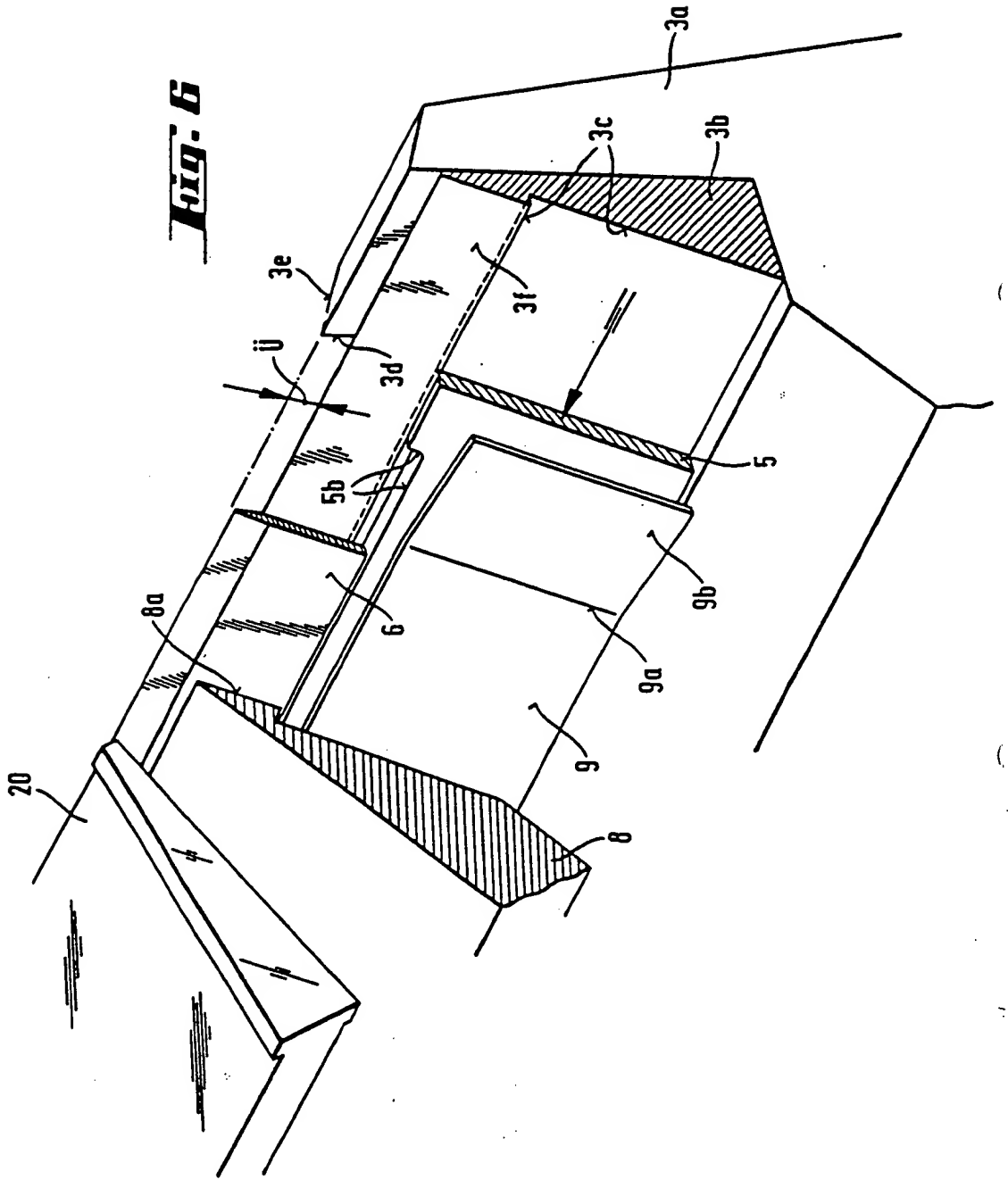


Fig. 6



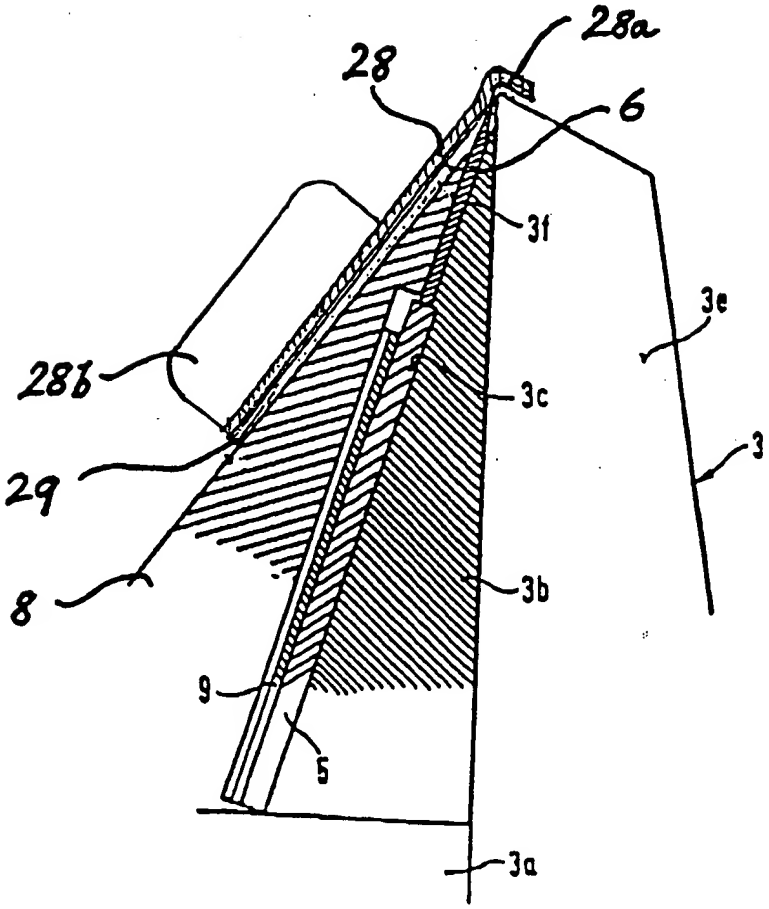


Fig. 7

HOLDING MEANS FOR THE BLADE-SHAPED CUTTING KNIFE OF A MICROTOME

The invention relates to a holding means for the blade-shaped cutting knife of a microtome.

It is an object of the invention to improve a holding means of the type described above so that all commercially available blade-shaped cutting knives can be inserted easily and quickly in the holding means.

The present invention provides a holding means for the blade-shaped cutting knife of a microtome, wherein the cutting knife can be firmly clamped at its rear surface and its front surface, which is opposite the rear surface, between a clamping jaw secured to a base mamber and a pressure plate which is movable relative to the clamping jaw, the cutting edge of the knife projecting from the holding means and the back of the knife resting against an abutment, wherein the abutment is formed by a slide means slidably guided in the clamping jaw in a direction parallel to the edge of the knife, said slide means having a recess for accommodating the back of the knife, which recess encloses at least partially the lateral edges of the cutting knife.

So as to exchange the cutting knives in this arrangement, the user only has to withdraw the slide means partially from the clamping jaw and insert the respective knife with its back in the recess. This recess can be designed such that the longest commercial cutting knife for this purpose can be accommodated therein, or an individual slide means may be provided for any type of knife available for exchange.

Particularly easy and precise guidance as well as ease of operation of the slide means can be achieved by providing in the clamping jaw a cavity enclosing the longitudinal edges of the slide means, by designing the slide means so that it has a size exceeding the depth of said cavity preferably by approximately the thickness of the cutting knife, and by providing the slide means with a handle extending upwardly from the surface facing the user.

In order to ensure easy and smooth running of the slide means, a brake spring disposed between the clamping jaw and the pressure plate preferably rests against the slide means. Appropriately, the brake spring is

formed by a leaf spring secured to the pressure plate and bent in the direction of the slide means, and a flap obliquely extending away from leaf spring is next to the bent portion resting against the slide means, said flap serving as a feed slope for the slide means.

Unintentional contact with the cutting edge of the knife located outside the region covered by the pressure plate can be prevented by arranging for the clamping jaw to extend beyond the cutting edge of the knife by a length preventing the touching of this cutting edge and to have only in the region of the pressure plate a portion having a depth exposing the edge of the knife for the cutting operation. Conveniently, the holding means may be displaceable along guide means.

In an advantageous embodiment of the invention, a swivel plate is supported on the base member, said swivel plate carrying a section straightening means comprising a holding-down plate pivotal about an axis perpendicular to the swivel axis and resting with its front edge against the rear surface of the cutting knife, the holding-down plate being provided with lateral ribs elevated relative to the plate surface by a minimum gap width to be maintained relative to the rear surface of the cutting knife, and an adjusting means is provided for adjustably lifting the holding-down plate from the surface of the cutting knife beyond said minimum gap width.

This arrangement ensures that the minimum gap width required for inserting the sections under the section straightening means is kept in any case, and that said gap width which is sufficient in the majority of cases is achieved without special adjustment and is exactly maintained over the entire width of the gap.

So as to be able to provide a different adjustment in the case of need, a stop pin adjustable via an adjusting screw is disposed in the swivel plate mounted on the base member, the tip of said stop pin resting against the base member. Besides, when the stop pin is acted upon by the force of a spring which places said pin in its effective direction against an adjustable stop. it is possible in cases when said holding-down plate does not rest against the rear surface of the cutting knife with both ribs, to align said holding-down plate parallel to said surface by briefly pressing the entire section straightening means against the cutting edge of the knife,

counteracting the spring force of the stop pin, and subsequently releasing it again.

According to another advantageous feature of the invention, the holding-down plate pivotably mounted on the swivel plate can be displaced along its swivel axis and, under the force of a pressure spring, rests against an adjustable stop limiting its path of displacement in a direction leading away from the swivel plate. In this simple manner, the front edge of the holding-down plate can be adjusted exactly to the point of support most favourable for the flowing-off of the section, and the holding-down plate can yield in the case of disturbances in the flowing-off of the section.

For this purpose, it is appropriate for the holding-down plate to be secured to a threaded spindle which is mounted in a longitudinally displaceable manner on a support member fixed to the swivel plate and carries at its end diposed away from the holding-down plate a thread over which a nut, preferably a cap nut, resting against the support member is screwed to serve as an adjusting knob. In an advantageous embodiment, a guide pin is placed through the threaded spindle, said guide pin being guided in a guide slot of the support member, which guide slot is open in the direction of the holding-down plate, and a pressure spring placed on the threaded spindle is inserted between the holding-down plate and the support member.

In a further embodiment of the invention, the holding-down plate mounted on the swivel plate is pivotal about 180° and designed in a wedge-shaped manner such that its front surface has a different angular position relative to the swivel axis than its rear surface. The holding-down plate can be swung, for example, by removing the afore-mentioned guide pin by corresponding adjustment of its stop from the region of the guide slot which is open on one side, whereupon the holding-down plate can be swung by 180° and the guide pin can be re-inserted in the guide slot in the swivel position thus obtained. It is thus possible to adjust two different angles of inclination of the surface of the holding-down plate which is in contact with the section flowing off underneath the knife.

Finally, for protecting the cutting knife in the intervals between the operating phases, a magnetic cover plate can be fastended to the upper

surface of the pressure plate in the period in which the holding means is placed in readiness, which cover plate has at its front edge a downwardly bent ledge enclosing the cutting edge of the cutting knife and at its lateral edges upwardly bent handle flaps.

There will now be described an example of the holding means according to the invention . The description is given by way of example only and not by way of limitation.

In the drawings:

Fig. 1 shows a perspective view of the holding means according to the invention,

Fig. 2 shows a sectional view of the means along the II-II line in Fig. 1, with a first angular position of the holding-down plate of the section straightening means,

Fig. 3 shows a sectional view of the means with the second angular position of the holding-down plate,

Fig. 4 shows an enlarged representation of detail IV in Fig. 2,

Fig. 5 shows a sectional view of the holding-down plate along the V-V line in Fig. 4,

Fig. 6 shows a partially sectional perspective representation of the slide guide and the blade-shaped cutting knife inserted in the slide means, and

Fig. 7 shows a magnetic cover plate to be placed on the pressure plate for the cutting knife.

According to Figs. 1 and 2, there is a bottom member 1 of the holding means on which a base member 2 is pivotally mounted, with a clamping jaw 3 being secured to said base member. For reasons of manufacture, the clamping jaw 3 is composed of a post 3a and a wedge-shaped ledge 3b. The pivotability of the base member 2 serves in known manner to set a specific cutting angle of the cutting knife and can be provided in the manner described in German Utility Model Publication G 84 11 024.4, for instance, which will not be dealt with in more detail here. At the outside of the

holding means there is provided an operating lever 4 to fix the respectively selected angle of inclination (Fig. 1).

In the clamping jaw 3 there is mounted a slide means 5 in a guide cavity 3c, said slide being insertable in the holding means in the direction of arrows shown. The slide means 5 has at one end a handle 5a extending upwardly from the surface of the slide means facing the user. As can be seen particularly from Fig. 6, a recess 5b is formed on the upper edge of the slide means 5, in which recess a blade-shaped cutting knife 6 can be inserted. The bottom of the recess 5b forms a firm abutment for the back of the knife.

The length of the recess 5b enclosing the back of the knife is selected such that the longest of the commercial knives available for exchange fits in there. The resulting possible lateral displacement of the shorter knives relative to the slide means has no adverse effect on the cutting operation if the side surfaces of the knife are reliably held during the actual cutting operation in the manner described in the following. On the contrary, lateral displacement of the cutting knife, either relative to or together with the slide means, is advantageous, for it allows to change the actual cutting point and thereby to increase the edge life of the knife. Apart from that, the simple design of the slide means accommodating the cutting knife makes it possible to provide for any type of knife an individual slide means exactly suited for the respective cutting knife and to exchange cutting knife and slide means together as a unit.

So as to ensure smooth running and easy displacement of the slide means 5, a leaf spring 9 is inserted between the slide means and a pressure plate 8 arranged above the slide means, said leaf spring resting against the slide means 5 via an bent edge 9a. The leaf spring 9 is screwed to the pressure plate 8 (in a manner not shown in detail) and also serves to lift the pressure plate from the cutting knife in a manner described in more detail below, when the pressing means of the pressure plate is open. Next to the bent edge 9a there is a flap 9b obliquely extending away from the leaf spring 9, said flap acting as feed slope during insertion of the slide means. Besides, guide pins 14 are arranged on the clamping jaw 3 as further guiding aids for insertion of the slide means 5.

The pressure plate 8 is secured to the post 3a of the clamping jaw 3 via screws 7. The screws 7 are only tightened to an extent which still permits a certain tilting motion of the pressure plate 8. This tilting motion is caused by an eccentric shaft 10 supported in the post 3a. The eccentric shaft is provided at its outer end with an operating lever 11 (Fig. 1).

In the position of the eccentric shaft 10 as illustrated in Fig. 3, said shaft is urged against a tension spring 12 secured to the pressure plate 8 via screws 13, said tension spring thus causing the upper edge of the pressure plate 8 to rest against the cutting knife 6. In a position of the eccentric shaft 10 rotated by 90° relative to the position shown in Fig. 3, the surface 10a of said eccentric shaft rests against the tension spring 12 which is thereby released. At the same time, the surface 10a forms a locking surface for locking the outer operating lever in said released position of the pressing means in which also the pressure plate 8 is lifted from the cutting knife 6 through the action of the leaf spring 9 described above.

When the spring 12 is under tension, an elevated contact surface 8a of the pressure plate 8 exerts pressure on the cutting knife 6 inserted in the slide means 5, which cutting knife is thereby immovably clamped between said contact surface 8a and a further contact surface 3f of the wedge-shaped ledge 3b.

So as to prevent unintentional contact with the edge of the knife, the upper edge of the post 3a extends beyond the cutting edge of the knife 6 (Fig. 1). Only in the area of the pressure plate 8 have the clamping plate 3 and the post 3a a recess 3d of a depth Ü (Fig. 6) which exposes the edge of the knife. In this area, a vertical recess 3e is additionally formed in the post 3a, which makes it possible to advance the cutting knife to the specimen clamping means (not shown).

On the base member 2, there are arranged bearing blocks 15 carrying an shaft 16. On said shaft 16 a swivel plate 17 is supported. A preferred central position of the swivel plate 17 is achieved by an arresting means (spring bolt) which engages a groove of the shaft 16 (not shown). The swivel plate 17 can be moved along the shaft 16 laterally parallel to the edge of the knife so that a large free space in the cutting area is obtained.

On a roof-shaped support member 18 of the swivel plate 17, there is supported a threaded spindle 19 carrying on its rear end a thread 19a. On the front end of the threaded spindle 19 a wedge-shaped holding-down plate 20 is placed which is preferably made of transparent plastics. Onto the thread 19a there is screwed a cap nut 21 which rests against the support member 18 in the direction C under the force of a pressure spring 22 placed on the threaded spindle 19 between the support member 18 and the holding-down plate 20. The cap nut 21 thus serves to adjust the axial position of the threaded spindle 19 and the holding-down plate 20 secured thereto. The pressure spring 22 permits yielding of the holding-down plate 20 in the direction F in the case of defects in the section straightening means.

The rotational position of the holding-down plate 20 required for the cooperation with the cutting knife 6 is achieved via a guide pin 23 placed through the threaded spindle 19 and extending in a guide slot 18a of the support member 18, said guide slot being open in the direction of the holding-down plate 20. The guide pin 23 has a little play in the guide slot 18a. This makes it possible for the holding-down plate 20 to adjust itself exactly in parallel with the surface of the knife upon resting thereagainst under the rotation-inhibiting force of the spring 22 without altering the gap width between the knife and the holding-down plate.

As can be seen particularly from Fig. 3, the holding-down plate has a wedge-shaped cross-section, the front surface of the holding-downn plate having a different angle of inclination relative to the axis of the threaded spindle 19 than the rear surface. That is to say, when the cap nut 21 is screwed such that the guide pin 23 can leave the guide slot 18a, it is possible to alter in two steps the angle of inclination between the cutting knife 6 and the holding-down plate 20 of the section straightening means by rotating the holding-down plate 20 lifted from the cutting knife 6 in the direction A by 180° in direction B or E and then place the holding-down plate against the cutting knife 6 in the direction G again.

As can be seen from the sectional views of the section straightening means, the weight thereof is distributed such that the overall gravity center of the section straightening means lies between the shaft 16 and the cutting knife 6 when the holding-down plate 20 rests against the cutting knife 6.

so that the front edge of the holding-down plate 20 rests against the cutting knife 6 under the influence of gravity.

As can be seen particularly from Figs. 4 and 5, the holding-down plate 20 does not rest against the cutting knife 6 with its entire surface but is provided with lateral ribs 20a and 20b which ensure that a minimum gap width S or S' between the respective plate surface facing the cutting knife and the surface of the knife is maintained. This minimum gap width suffices in most cases to guarantee an undisturbed discharge of the section under the section straightening means; brief disturbances are compensated for by the resilience of the holding-down plate in the direction F.

In cases where said minimum gap width does not suffice, the front edge of the holding-down plate 20 can be lifted further from the cutting knife via a stop pin 24 supported in the swivel plate 17 and resting against the base member 2. The stop pin 24 is supported in an adjustable insert nut 25 and is acted upon by a pressure spring 26 which urges the pin in its effective direction against a stop of the adjustable insert nut 25.

It is thus possible to undo the effect of the stop pin by overcoming the force of the pressure spring 26 and to align the holding-down plate 20, which is only inaccurately aligned by the guide pin 23, as mentioned above, exactly parallel to the surface of the knife by briefly pressing the holding-down plate 20 against the cutting knife 6. Said pressing as well as the lifting of the section straightening means can be effected via the handles 27 illustrated in Fig. 7.

As can be seen from Fig. 7, a permanent magnetic cover plate 28 can be placed on the pressure plate 8 in the intermissions of operation of the holding means, said cover plate protectively enclosing the cutting edge of the knife 6 via a bent ledge 28a. At the lateral edges of the magnetic cover plate there are provided handle flaps 28b. For protection of the pressure plate 8, the magnetic cover plate 28 has at its lower surface a coating 29 of rubber or plastics.

CLAIMS:

1. Holding means for the blade-shaped cutting knife of a microtome, wherein the cutting knife can be firmly clamped at its rear surface and its front surface, which is opposite the rear surface, between a clamping jaw secured to a base member and a pressure plate which is movable relative to the clamping jaw, the cutting edge of the knife projecting from the holding means and the back of the knife resting against an abutment, wherein the abutment is formed by a slide means slidably guided in the clamping jaw in a direction parallel to the edge of the knife, said slide means having a recess for accommodating the back of the knife, which recess encloses at least partially the lateral edges of the cutting knife.

2. Holding means according to claim 1, wherein there is provided in the clamping jaw a cavity enclosing the longitudinal edges of the slide means, and the slide means is of a size preferably exceeding the depth of said cavity by about the thickness of the cutting knife.

3. Holding means according to claim 2, wherein a handle protruding upwards from the surface facing the user is provided on the slide means.

4. Holding means according to any of claims 1 to 3, wherein a brake spring disposed between the clamping jaw and the pressure plate rests against the slide means.

5. Holding means according to claim 4, wherein the brake spring is formed by a leaf spring bent in the direction of the slide means and secured to the pressure plate.

6. Holding means according to claim 4 or 5, wherein next to said bent portion resting against the slide means there is a flap extending obliquely from the leaf spring, which flap serves as a feed slope for the slide means.

7. Holding means according to any of the preceding claims, wherein the clamping jaw extends beyond the cutting edge of the knife by a portion preventing said cutting edge from being touched and has a portion of a depth exposing the cutting edge for the cutting operation only in the region of the pressure plate.

8. Holding means, according to any of the preceding claims, wherein on the base member there is provided a swivel plate carrying a cut section straightening means comprising a holding-down plate pivotal about an axis perpendicular to said swivel axis and resting with its front edge against the rear surface of the cutting knife, said holding-down plate being provided with lateral ribs elevated relative to the plate surface by a minimum gap width to be maintained with respect to the surface of the cutting knife, and that there is provided an adjusting means for adjustably lifting the holding-down plate from the surface of the cutting knife beyond said minimum gap width.

9. Holding means according to claim 8, wherein a stop pin adjustable via an adjusting screw is provided in the swivel plate supported in the base member, the tip of said stop pin resting against the base member.

10. Holding means according to claim 9, wherein the stop pin is acted upon by the force of a spring which places said pin in its effective direction against an adjustable stop.

11. Holding means according to claim 10, wherein the rotation-inhibiting action of a further spring and the restoring force of the first mentioned spring guarantee a parallel alignment of the holding-down plate with a gap width greater than said minimum gap relative to the edge of the knife after pressing of the means against the knife.

12. Holding means according to any of claims 8 to 11, wherein the holding-down plate pivotably mounted on the

swivel plate can be displaced along its swivel axis and, under the force of a pressure spring, rests against an adjustable stop which limits its path of displacement in a direction leading away from the swivel plate.

13. Holding means according to claim 12, wherein the holding-down plate is secured to a threaded spindle supported in a longitudinally slidable manner in a support member secured to the swivel plate and carries on the end thereof disposes away from the holding-down plate a thread about which a nut, preferably a cap nut, resting against the support member is screwed, which nut serves as an adjusting knob.

14. Holding means according to claim 13, wherein a guide pin extends through the threaded spindle, which is guided in a guide slot of the support member, said guide slot being open in the direction of the holding-down plate, and a pressure spring is inserted between the holding-down plate and the support member, said pressure spring being placed on the threaded spindle.

15. Holding means according to any of the preceding claims, wherein the holding-down plate supported on the swivel plate is pivotal about 180° and is wedge-shaped such that its front surface has a different angular position relative to the swivel axis than its rear surface.

16. Holding means according to any of the preceding claims, wherein a magnetic cover plate can be fastened to the upper surface of the pressure plate during the phase when the holding means is placed in readiness, which magnetic cover plate has at its front edge a downwardly bent ledge enclosing the cutting edge of the knife and at its lateral edges upwardly bent handling flaps.

17. Holding means according to any of the preceding claims, wherein the means is displaceable along guide means.

18. Holding means for the blade-shaped cutting knife of a microtome, constructed and arranged substantially as hereinbefore described with reference to and as shown in the drawings.

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